

Transfer Efficiencies of Pesticides from Household Ceramic Tile to Foods

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Key Words: human exposure, pesticides, excess dietary exposure, food contamination

Traditional assessments of pesticide exposure through diet have focused on contamination during production (e.g., pesticides in agriculture). However, recent residential monitoring studies have demonstrated that a significant portion of total exposure to infants and children can result from food contamination in homes following residential pesticide usage. The US EPA's Office of Research Development (ORD) is generating exposure data and models specifically concerning these exposures for accurate assessments. These exposures, termed excess dietary exposure, occur from foods handled by children in homes where pesticides have been applied. Foods become contaminated from either direct contact with contaminated surfaces (surface-to-food) and/or through an intermediate, such as hands (surface-to-hands-to-food).

Excess dietary exposure estimates require empirically determined measurements of transfer efficiencies of pesticides from contaminated household surfaces to foods handled by children. Limited data exist concerning these transfers, but they have been shown to be a critical element in estimating children's excess dietary exposure. This study was conducted to determine the transfer efficiencies (%) of pesticides (organophosphate, pyrethroid, and pyrazole insecticides) from ceramic tile, a common household surface, to three different types of food (bologna, apple, and Fruit Roll-Ups[®]) that are representative of items (i.e., meat, fruit, and snack foods) typically handled and eaten by children. The study also determined the moisture and fat content of each food as tools for predicting transfer efficiencies.

The highest transfer efficiencies were observed for the organophosphate pesticides to bologna (56-79%). Lower transfer efficiencies were observed for apples (20-37%) and Fruit Roll-Ups (6-17%). Transfer efficiencies of pyrethroid pesticides to bologna were 33-52%. The corresponding transfer efficiencies to apples and Fruit Roll-Ups were 12-34% and 3%, respectively. Fipronil (pyrazole insecticide) had a similar transfer to that of the pyrethroids (bologna 39-45%, apple 13-41%, and Fruit Roll-Up 4%). The average percent fat content for bologna, apples, and Fruit Roll-Ups were 30%, 1%, and 7%, respectively. The corresponding average percent moisture content was 54%, 85%, and 11%, respectively. Although neither the percentage of fat nor moisture content directly projects the ranking of transfer between the foods, these two factors combined may provide a better prediction of transfer. Ultimately, these results suggest that the extent of transfer is affected by the food type and chemical properties of the pesticide itself. Findings from this study, in conjunction with models under development, will be used to generate more accurate estimates of excess dietary exposure to infants and children in homes where pesticides are used.